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**Best Seller!?! Unintended Negative Consequences of Popularity Signs On Consumer  
Choice Behavior**

Arezou Ghiassaleh<sup>a</sup>

Bruno Kocher<sup>b</sup>

Sandor Czellar<sup>c</sup>

<sup>a</sup> Arezou Ghiassaleh (corresponding author), Assistant Professor of Marketing, Durham University Business School, Mill Hill Lane, Durham, United Kingdom, Tel: +44 (0)191 3345284, [arezou.ghiassaleh@durham.ac.uk](mailto:arezou.ghiassaleh@durham.ac.uk).

<sup>b</sup> Bruno Kocher, Professor of Marketing, University of Neuchâtel, Rue A.-L. Breguet 2, 2000 Neuchâtel, Switzerland, Tel: +41(0) 327181409, [bruno.kocher@unine.ch](mailto:bruno.kocher@unine.ch)

<sup>c</sup> Sandor Czellar, Professor of Marketing, Faculty of Business and Economics (HEC), University of Lausanne, UNIL-Chamberonne, 1015 Lausanne, Switzerland, Tel: +41(0) 216923461, [sandor.czellar@unil.ch](mailto:sandor.czellar@unil.ch).

**Abstract**

Popularity signs (e.g., “best seller”, “top rated”) are frequently employed by marketers to help consumers in their purchase decisions. Whereas extant research focused mostly on the positive aspects of such a strategy, we demonstrate that it can also have adverse effects on consumer post-choice behavior. Depending on consumer regulatory orientation, such popularity signs can make the decision task more complex and increase feelings of uncertainty. The results of seven studies, including real choice decisions and field data, show that the provision of popularity signs can have negative consequences on consumers with a prevention (vs. promotion) focus by increasing the heterogeneity of their consideration set, which in turn is associated with an increase in choice uncertainty and a decrease in choice commitment. Beyond their theoretical significance, our findings shed novel light on the ways to implement popularity signs for a more efficiently targeted marketing effort.

*Keywords:* Popularity signs, Regulatory focus, Consideration set, Choice commitment

## 1. Introduction

Consumers today have access to an impressive array of product offerings, especially online. However, considerable cognitive effort is required to compare, evaluate, and choose from a large set of alternatives, and in response, retailers have implemented a range of techniques to help consumers in their choices (e.g., Broniarczyk & Griffin, 2014). Many retailers offer tools that assist consumers in screening a large set of options, thus simplifying their decision processes (e.g., Häubl & Trifts, 2000; Spenner & Freeman, 2012). A frequently used technique is to release information about products' popularity to help consumers narrow a choice set and construct a less effortful decision (Axsom, Yates, & Chaiken, 1987; Cai, Chen, & Fang, 2009). One common way of providing popularity information is to employ popularity signs such as "best seller" or "top rated" on products indicating information such as user evaluations, consumer collective preferences, or herding norms within a product category (Carare, 2012; Goodman, Broniarczyk, Griffin, & McAlister, 2013).

How do consumers react to the presence of popularity signs? When choosing from a large set of options, consumers may rely on the information provided by available cues, such as popularity signs, to screen the set of products and simplify their choice tasks (Metzger, Flanagan, & Medders, 2010; Spenner & Freeman, 2012). This information may facilitate decisions by narrowing the choice set, reducing the search effort, and increasing certainty in the decision process (e.g., Gershoff, Broniarczyk, & West, 2001). Popularity signs may also be considered a validation of product quality and fit, which can reassure consumers about their choices (Goldstein et al., 2008; Hanson & Putler, 1996). Indeed, consumers with imperfect information tend to rely on the decisions of others to make their own decision (Dholakia, Basuroy, & Soltysinski, 2002). Thus, the bulk of prior research converges in suggesting that, in general, popularity signs can help consumers in their decision processes.

Concurrently, an emerging stream of research highlights the potentially negative consequences of providing popularity information for consumers. For example, Goodman et al. (2013) show that when consumers have clearly developed preferences, the provision of popularity signs such as “best seller” might expand the size of their consideration sets and impede choice-relevant decision making. Moreover, although popularity information might increase the perception of product quality, it may also, in some situations, indicate that the product is appealing to a broad range of tastes and therefore reduce the perception of uniqueness (Tucker & Zhang, 2011). Relatedly, Fitzsimons and Lehmann (2004) demonstrate that if a highlighted product contradicts the initial impression of consumers about their choice, it reduces satisfaction and generates reactance.

We qualify and extend this stream of research in three major ways. First, we theorize that regulatory focus (Higgins, 1998) moderates the effect of popularity signs on consumer decision processes. So far, the motivational factors underlying consumer response to popularity signs have received little attention. We address this gap by examining the effect of regulatory focus, as a key motivational orientation that individuals adopt during goal pursuit, on consumer response to the presence of popularity signs. We argue that consumers have different opinions about popularity signs and react differently to them depending on their situational or chronic regulatory orientation. Second, we take a more granular view of the importance of consumers’ consideration set formation. We demonstrate that the presence of popularity signs influences consideration set heterogeneity, which is an important factor in consumer decision processes. Third, we investigate the downstream behavioral consequences of popularity signs on consumer post-choice behavior (i.e., choice commitment; Mogilner, Aaker, & Pennington, 2008). Enhancing consumer post-choice experience can benefit both consumers and retailers. Higher levels of post-choice satisfaction reduce the likelihood of product switching and returns, which are costly for retailers (Janakiraman, Syrdal, & Freling,

2016). Positive post-choice experiences also help marketers increase loyalty and positive word of mouth (e.g., Dijksterhuis & Van Olden, 2006).

In summary, we argue that popularity signs represent a valuable but complex tactical tool in retailers' marketing toolbox. We show that for some consumers in some situations, popularity signs can render the decision process more difficult, adversely affecting post-choice behavior. We contend that consumers' regulatory orientation can be a key factor for potentially negative effects of popularity signs. We highlight the mental processes that may be responsible for these effects and provide marketers with actionable managerial advice.

## **2. Conceptual framework and hypotheses**

### *2.1. The role of regulatory focus in consumer reaction to popularity signs*

Regulatory focus theory (Higgins, 1998) describes two major motivational orientations that people may adopt during goal pursuit: promotion focus and prevention focus. Individuals who adopt a promotion focus regulate their behavior in support of their goals of growth and advancement. Individuals who adopt a prevention focus regulate their behavior in support of their goals of safety and security (Aaker & Lee, 2006). Consumers might differ in their chronic regulatory focus (Higgins, 1998) or adopt a temporary promotion- or prevention-focused state depending on the decision context (e.g., Friedman & Förster, 2001; Luo, Wong, & Chou, 2016). The marketing environment can be a source of consumer regulatory focus, too: product categories with stronger associations with a promotion focus (e.g., jewelry) can prime consumers' promotion goals, whereas those associated with a prevention focus (e.g., helmets) can prime prevention goals (Labroo & Lee, 2006). Marketing messages can also orient consumers towards a promotion focus, such as the Colgate tagline “toothpastes to

brighten every smile,” or a prevention focus, such as Alka-Seltzer’s tagline “heartburn relief day or night.”

How do consumers react to the presence of popularity signs as a function of their regulatory orientation? We argue that the very presence of a popularity sign impacts the decision processes and post-choice behaviors of promotion- and prevention-focused consumers differently. Prior research has shown that consumers with a promotion focus tend to perceive the decision environment as relatively benign, and they are more willing to take risks and capture opportunities to ensure their advancement (Righetti, Finkenauer, & Rusbult, 2011). They also tend to be relatively less sensitive to social norms when making decisions (Pham & Higgins, 2005). Lee, Aaker, and Gardner (2000) demonstrate that promotion focus is associated with being independent and focusing on personal preferences. Thus, promotion-focused consumers may tend to follow their personal opinion and make choices independently of others. We argue that they may attach little importance to the presence of popularity information and, thus, popularity signs are less likely to affect their choice behavior.

By contrast, prevention-oriented consumers may engage in a more nuanced decision behavior. On the one hand, they tend to attend more to social norms than promotion-focused consumers (Pham & Higgins, 2005). They are inclined to keep connection with others to fulfill obligations and avoid mistakes (Lee et al., 2000). Therefore, popularity signs may reassure them by providing information about others’ past choices and experiences with the product. On the other hand, prevention-focused consumers may also perceive the decision environment as relatively threatening (Righetti et al., 2011). They are typically focused on the specific aspects of their goal, which is to maintain security, and tend to adopt a risk-averse and cautious approach (Chernev, 2004; Trudel, Murray, & Cotte, 2012). Prevention-focused consumers are also more conservative during their goal striving and tend to avoid being overly persuaded (Friedman & Förster, 2001; Liberman, Molden, Idson, & Higgins, 2001).

Therefore, they are more vigilant against the manipulative intent of marketers, which leads to the activation of persuasion knowledge and skepticism toward marketing activities (Kirmani & Zhu, 2007; Righetti et al., 2011). As such, prevention-focused consumers may interpret a popularity sign on a product as a potential cue that increase the stakes of making an error of commission (e.g., Pham & Higgins, 2005). The presence of popularity signs in a choice set then acts as a complex signal for prevention-focused consumers: the social norm information may reassure them yet its commercial nature may increase their doubts about it being a mere persuasion tool. Hence, prevention-focused consumers may perceive the choice decision environment with (vs. without) popularity signs as more elaborate and complicated, resulting in increased doubt and uncertainty about their choice decisions (e.g., Broniarczyk & Griffin, 2014; Hassan et al., 2013). We thus contend that the presence of popularity signs makes prevention-focused consumers feel more uncertain whether they are selecting the optimal option. As uncertainty about the choice decision leads to the reluctance to stick with a single alternative (Dhar, 1997), such consumers will then have a greater willingness to switch their selected product when given the opportunity to do so. These arguments lead to our first two hypotheses:

**H1.** The presence (vs. absence) of popularity signs on products in a choice set increases choice uncertainty for prevention- (vs. promotion-) focused consumers.

**H2.** The presence (vs. absence) of popularity signs on products in a choice set decreases choice commitment for prevention- (vs. promotion-) focused consumers.

## *2.2. The mediating role of consideration set heterogeneity*

What kinds of psychological processes may be responsible for the hypothesized effects? Dellaert and Häubl (2012) show that presenting products in attractiveness order, and therefore highlighting the best products, can drive consumers to perform more in-depth



comparisons between available options. We build on this evidence and contend that popularity signs can affect the way consumers select alternatives to form their consideration set. We argue that regulatory focus moderates the way consumers form their consideration sets in the presence (vs. absence) of popularity signs.

Consideration set formation is an important stage in the decision-making process (Chakravarti & Janiszewski, 2003). The composition of the consideration set depends on how consumers screen and process the alternatives and can comprise either similar (homogeneous) or dissimilar (heterogeneous) products (Mussweiler, 2003; Roberts & Lattin, 1991). The heterogeneity of the consideration set depends on several factors, including the number of attributes and their differences among products in the set (Dhar, 1997). We argue that, depending on consumer goal orientation, the presence of popularity signs leads consumers to include different types of products in their consideration set. As mentioned previously, prevention-focused consumers tend to avoid errors of commission and try to reduce decision risks (e.g., Pham & Higgins, 2005). They employ avoidance strategies when exposed to marketing activities, and in an attempt to make an optimal decision, become more alert about the manipulative intent of marketers (Kirmani & Zhu, 2007). Therefore, the presence of popularity signs may lead prevention-focused consumers to be more vigilant and risk-averse than their promotion-focused counterparts. To spread the risks and diversify the potential portfolio of choice options, consumers are more likely to retain relatively more dissimilar items in their consideration set (Chakravarti & Janiszewski, 2003; Medin, Goldstone, & Markman, 1995). We thus contend that the presence of popularity signs may drive consumers with a prevention (vs. promotion) focus to form more heterogeneous consideration sets. Furthermore, we argue that choosing from a more heterogeneous consideration set (i.e., with dissimilar options) might increase uncertainty about the choice decision. Prior research shows that consumers experience conflict and doubt when their consideration set involves a tradeoff

between different attributes (e.g., Tversky & Shafir, 1992). Therefore, uncertainty about the choice decision may be greater when the consideration set involves alternatives with dissimilar (vs. similar) attribute characteristics (i.e., heterogeneous set). Uncertainty about the choice decision can then result in reluctance to stick with an alternative in the post-decision process (i.e., lower choice commitment). We thus argue that the negative effect of popularity signs on consumer choice commitment can be driven by the change in the composition of the consideration set, which in turn can lead to choice uncertainty. We therefore propose the following:

**H3.** Consideration set heterogeneity and choice uncertainty sequentially mediate the moderating effect of regulatory focus on choice commitment, such that the presence (vs. absence) of popularity signs on products increases consideration set heterogeneity, which in turn is associated with an increase in choice uncertainty and a decrease in choice commitment for prevention- (vs. promotion-) focused consumers.

### *2.3. Assortment size and the signaled product's framing as boundary conditions*

As theorized in the previous sections, consumers with a prevention (vs. promotion) focus may experience a higher level of uncertainty in their choice process, and form a more heterogeneous consideration set when popularity signs are present (vs. absent). We argue that marketers have two key variables at their disposal to influence consumer choice processes. The first variable is the size of the product assortment. The advent of online retailing has led to an ever-increasing size of the proposed assortments (Broniarczyk, 2008). Consumers tend to favor larger rather than smaller assortments because they provide more perceived variety and utility (Aydinli, Gu, & Pham, 2017). However, large assortments may also increase the occurrence of conflict between consumer preferences and the signaled products (Goodman et al., 2013). As assortment size increases, so does the number of attributes and alternatives.

Therefore, large assortments can increase the likelihood of more heterogeneous consideration sets being formed and enhance the complexity of comparisons (e.g., Schwartz, 2004).

Conversely, when consumers choose from small assortments, they can focus more on the characteristics of the entire set and be more confident that they are selecting the optimal option. We therefore predict that the outcome of the decision process proposed in our previous hypotheses is dependent on the overall size of the assortment. Thus:

**H4.** The presence (vs. absence) of popularity signs on products decreases choice commitment for prevention- (vs. promotion-) focused consumers when they choose from a large assortment but not when they choose from a small assortment.

The second variable that marketers can influence is the framing of the signaled product. According to prior research, the framing of the product description can induce either promotion- or prevention-focused purchasing goals, and products can serve as a means to achieve such goals (Mogilner et al., 2008). Products can be framed to achieve positive outcomes and thus be more promotion focused, or they can be framed to avoid negative outcomes and thus be more prevention focused. For example, a toothpaste can be framed as a product that helps to suppress bad breath (prevention-focused) or helps to freshen your breath (promotion-focused). If the presence of popularity signs drives consumers with a prevention (vs. promotion) focus to be more skeptical and uncertain, providing information about the product that is consistent with their goal orientation could mitigate these negative feelings. Indeed, information that fits (vs. does not fit) with consumer regulatory focus is processed more easily, is more persuasive, and has a greater impact on consumer behavior (Cesario, Grant, & Higgins, 2004; Lee & Aaker, 2004). Thus, a product framing that matches (vs. does not match) consumer regulatory focus is likely to offset the potentially aversive effect of popularity signs on consumer decision processes. These arguments lead to our last hypothesis:

**H5.** The presence (vs. absence) of popularity signs on products decreases choice

commitment among prevention- (vs. promotion-) focused consumers when the signaled product's framing is not congruent with their regulatory focus but not when the framing is congruent with their regulatory focus.

### **3. Overview of studies**

We test our hypotheses across seven studies. In Study 1, we measure consumers' chronic regulatory focus and show that the presence of popularity signs increases choice uncertainty for consumers with a higher prevention (vs. promotion) focus (H1). In Study 2, using real choice decisions, we manipulate regulatory focus and show that the presence of popularity signs decreases choice commitment among consumers with a prevention (vs. promotion) focus (H2). In Study 3, we examine the underlying mechanism of this effect and show that the presence of popularity signs increases the heterogeneity of consideration sets for consumers with a prevention focus (H2 and H3). In Study 4, we examine the two boundary conditions of our core theorizing: assortment size and the framing of the signaled product (H4 and H5). Studies 5a and 5b demonstrate managerially relevant ways of identifying or manipulating regulatory focus and rule out an alternative explanation. Study 6 emphasizes the marketing relevance of our arguments and demonstrates that prevention- (vs. promotion-) focused products with popularity signs receive lower ratings and less positive reviews.

### **4. Study 1**

In this study, we used a large online sample and investigated consumers' recent purchase experiences in the presence of popularity signs. We measured consumers' chronic regulatory focus and expected prevention-focused consumers to be less certain about their choice when popularity signs were present (vs. control) during their purchase (H1). We also examined consumers' perceptions of their decision-making process and the popularity signs.

#### 4.1. Method

Eight hundred ninety-seven participants were recruited on Amazon Mechanical Turk (MTurk) in exchange for standard payment. The study involved two between-subjects experimental conditions: popularity sign vs. control. Chronic regulatory focus was measured as a continuous variable. Participants in the popularity sign condition were first provided with the definition and examples of such signs. They were asked to recall and describe a recent purchase during which they noticed the presence of relevant signs on products. Participants in the control condition were asked to recall and describe one of their most recent purchases from an online or a brick-and-mortar store. After describing their purchase experience, participants indicated how certain they were that they had made the best choice on a seven-point scale. Moreover, they responded to a four-item scale about the complexity of making their purchase (“It was very complicated/ difficult/ effortful/confusing”; 1 = *strongly disagree*, 7 = *strongly agree*; Cronbach’s  $\alpha = .89$ ; Dellaert & Stremersch, 2005). Participants in the sign condition also reported their opinions about the popularity signs on a seven-point scale (*unbelievable/believable*, *not truthful/truthful*, *deceptive/not deceptive*, *not credible/credible*; Cronbach’s  $\alpha = .93$ ; Kirmani & Zhu, 2007). Next, we measured participants’ chronic regulatory focus using an eight-item scale (e.g., “In general, I am focused on preventing negative events in my life”; “I frequently imagine how I will achieve my hopes and aspirations”; 1 = *not at all true*, 9 = *very true*; Cronbach’s  $\alpha = .70$ ; Lockwood, Jordan, & Kunda, 2002). This scale has been successfully used in prior work (e.g., Zhao & Pechmann, 2007). The study ended with demographic questions.

#### 4.2. Results

We examined the essays written by participants and excluded those who mentioned that they had not noticed any popularity sign or mistakenly described other signs (e.g., price-

related signs) which were not the purpose of our study. We used the data from the remaining 800 participants (60% female,  $M_{age} = 37.59$ ) in this study.

*4.2.1. Choice uncertainty.* We regressed choice uncertainty on the binary popularity sign variable (0 = control, 1 = sign present), the continuous regulatory focus variable, and the cross-product of these two variables. The results revealed a significant interaction effect ( $\beta = .17$ ,  $t(796) = 1.93$ ,  $p = .05$ ). The more prevention-focused participants were, the more they doubted that they had made the best choice when the sign was present (vs. control), in support of H1. The Johnson–Neyman value indicated that participants scoring 3.44 and above on the prevention focus scale showed a significant difference in choice uncertainty between the sign present and control conditions. The results also showed a main effect of regulatory focus ( $\beta = .14$ ,  $t(796) = 2.46$ ,  $p = .01$ ) but no main effect of popularity sign ( $\beta = -.34$ ,  $p > .2$ ) (see supplementary materials).

*4.2.2. Decision complexity.* A regression analysis revealed a significant interaction effect of popularity sign and regulatory focus on decision-making complexity ( $\beta = .15$ ,  $t(796) = 2.00$ ,  $p = .04$ ). Participants with a higher prevention focus experienced more complexity in the decision-making process when the sign was present (vs. control). The Johnson–Neyman value indicated that participants scoring 3.29 and above on the prevention focus scale showed a significant difference in complexity perceptions between the two conditions. The results also showed a marginally significant main effect of regulatory focus ( $\beta = .09$ ,  $t(796) = 1.82$ ,  $p = .07$ ) but no main effect of popularity sign ( $\beta = -.29$ ,  $p > .2$ ).

*4.2.3. Perception of popularity signs.* The results of a linear regression conducted within the popularity sign condition revealed that participants with a higher prevention focus reported higher skepticism toward the signs ( $\beta = -.20$ ,  $t(347) = -3.71$ ,  $p < .001$ ).

#### *4.3. Discussion*

The results of Study 1 suggest that the presence of popularity signs may increase choice uncertainty for consumers with a higher (vs. lower) prevention focus. Moreover, consumers with a higher prevention focus perceive popularity signs as complicating their decision-making process and are more skeptical about them. These first findings also stress the managerial importance of our research. Retailers can measure the chronic regulatory orientation of their customers and customize the provision of popularity signs to help them reduce feelings of decision complexity. Marketers can also adopt different contextual strategies to induce a specific regulatory focus in their customers. We examine these strategies in the next studies.

## **5. Study 2**

Study 2 investigates the effect of popularity signs on the choice commitment of consumers as a function of their situationally-induced regulatory focus. We presented real products to participants and examined their choice processes and post-choice behavior. We expected the presence of popularity signs to decrease the choice commitment of prevention- (vs. promotion-) focused consumers (H2).

### *5.1. Method*

We implemented a 2 (regulatory focus: promotion vs. prevention)  $\times$  2 (popularity sign: present vs. absent) between-subjects design. Participants were 129 students who took part in exchange for standard payment and a product that they would receive at the end of the experiment. Participants began by watching a commercial video that we designed about meal replacement bars (MRBs; e.g., cereal bars, protein bars, energy bars) and were asked to write an essay on this topic. In the promotion condition, the video and essay focused on how MRBs can help consumers attain positive outcomes (e.g., boosting energy), while in the prevention

condition, the video and essay focused on how MRBs can help consumers avoid negative outcomes (e.g., avoiding high blood pressure; adapted from Cesario et al., 2004).

After adopting one of the two corresponding goals, participants visited an online store that offered 27 MRBs and were asked to select one. We emphasized that they would receive the selected product at the end of the study. In the popularity sign present condition, three of the bars were highlighted as being “the most popular”; this information was not provided in the sign absent condition. After participants selected a product from the online store, they responded to a single-item mood scale (1 = *very unhappy*, 7 = *very happy*), a product familiarity scale (1 = *not at all familiar*, 7 = *extremely familiar*), and demographic questions.

Before leaving the lab, participants were presented with the physical version of the same products they were offered in the online store. They were told that they could take the product they had selected in the online store. Moreover, they had the opportunity to switch and take any other product. The experimenter recorded their choice and coded whether or not they had stuck with their initial choice, serving as our measure of choice commitment.

## 5.2. Manipulation checks

We conducted a pre-test ( $N = 85$ , from the same population as the main study) to examine whether the regulatory focus manipulation was effective. We examined whether participants’ thoughts were focused on avoiding negative outcomes or achieving positive outcomes with two seven-point items (Wan, Hong, & Sternthal, 2009). The results showed that participants in the prevention (vs. promotion) condition were more focused on avoiding negative outcomes ( $M_{prevention} = 4.60$  vs.  $M_{promotion} = 3.69$ ;  $t(83) = 2.42$ ,  $p = .02$ ), while participants in the promotion (vs. prevention) condition were more focused on achieving positive outcomes ( $M_{promotion} = 5.69$  vs.  $M_{prevention} = 4.19$ ;  $t(83) = -4.57$ ,  $p < .001$ ).



### 5.3. Results

We excluded participants who had failed to follow the procedure of the experiment (i.e., had not taken a product from the assortment). The analyses were based on the responses of the remaining 123 participants (50% female,  $M_{age} = 21.24$ ).

*5.3.1. Commitment to choice.* The results of a binary logistic regression revealed a significant interaction effect of popularity sign and regulatory focus ( $Wald(1) = 5.17, p = .02$ ). In support of H2, participants in the prevention condition were less likely to commit to their choice in the presence (38%) versus absence (68%) of the popularity sign ( $\chi^2(1) = 4.86, p = .03$ ). By contrast, participants in the promotion condition were more likely to commit to their choice in the presence (54%) versus absence (43%) of the popularity sign, but the difference was not significant ( $\chi^2(1) = .93, p > .2$ ). The main effects of popularity sign ( $Wald(1) = .92, p > .2$ ) and regulatory focus ( $Wald(1) = 1.69, p = .19$ ) were not significant.

*5.3.2. Control variables.* Our regulatory focus manipulation did not influence participants' mood ( $M_{promotion} = 5.01$  vs.  $M_{prevention} = 5.15; p > .2$ ). Moreover, including mood and familiarity measures as covariates in the analyses did not influence the pattern of results. These results are corroborated in the following studies.

### 5.4. Discussion

The results of Study 2 indicate that the presence of popularity signs in a choice set decreases choice commitment for prevention- (vs. promotion-) focused consumers. In the next study, we examine the mechanism underlying this effect by investigating the effect of popularity signs on consumers' consideration set formation.

## 6. Study 3

The purpose of Study 3 is to examine the role of consideration set heterogeneity in the effect of popularity signs on consumer choice commitment. We expected the presence (vs. absence) of popularity signs to lead to the formation of a more heterogeneous consideration set, which in turn could be associated with increased choice uncertainty and decreased choice commitment for prevention-focused consumers (H3).

### *6.1. Method*

Six hundred and six participants from MTurk took part in a 2 (regulatory focus: promotion vs. prevention)  $\times$  2 (popularity sign: present vs. absent) between-subjects design in exchange for standard payment. Participants began by watching a commercial video that we designed about tea and writing an essay on this topic. In the promotion condition, the video and essay focused on how different types of tea can help consumers attain positive outcomes, while in the prevention condition, the video and essay focused on how different types of tea can help consumers avoid negative outcomes. Participants next visited an online tea store that offered 27 different types of tea. In the popularity sign present (absent) condition, two of the products had (did not have) the “most popular” sign next to the picture of the product. To evaluate participants’ consideration set formation, we asked them to make purchase decisions in two steps. First, they chose the products they would consider buying. In the second step, we showed them those products and asked them to make their final choice from this consideration set. It was emphasized that they would enter a draw to win four boxes of their chosen tea product. After participants selected a product, they were asked to fill out a series of questions. As a measure of uncertainty, we asked them to indicate the extent to which they are certain that they had made the optimal choice (e.g., Dhar & Simonson, 2003) on three items (“To what extent do you wish that you had chosen any other option?”; “How interesting were the other options that you did not choose?”; “Please indicate the extent to which you

experienced regret about your final choice and wished you selected another option”, Cronbach’s  $\alpha = .65$ ). Next, participants responded to two manipulation checks of regulatory focus. First, we examined whether participants’ thoughts were focused on avoiding negative outcomes or achieving positive outcomes (1 = *avoiding negative outcomes*, 7 = *achieving positive outcomes*; Wan et al., 2009). Second, we asked participants on a four-item scale whether their thoughts were focused on specific promotion benefits (e.g., having a positive mood) or prevention benefits (e.g., preventing stress; 1 = *strongly disagree*, 7 = *strongly agree*; Lee & Aaker, 2004). Next, participants were reminded that they would be entered into a draw with the chance to win four boxes of their chosen tea. To measure choice commitment, participants were given the opportunity to change their choice of tea for this draw. Finally, they responded to mood, familiarity, and demographic questions similar to those in Study 2.

## 6.2. Results

Similar to the previous studies, we excluded participants who did not follow the procedure of the experiment (i.e., failed the essay task by copy pasting the question or other unrelated text; had not taken any product from the store). We used the data from 542 participants (48% female,  $M_{age} = 38.3$ ) for the analyses.

**6.2.1. Manipulation checks.** The results of independent-samples  $t$  tests show that participants in the prevention (vs. promotion) condition were more focused on avoiding negative outcomes ( $M_{promotion} = 6.19$  vs.  $M_{prevention} = 5.19$ ;  $t(540) = -7.48$ ,  $p < .01$ ). Moreover, participants in the prevention (vs. promotion) condition were more focused on prevention benefits (promotion focused items were reverse coded) ( $M_{prevention} = 4.13$  vs.  $M_{promotion} = 3.96$ ;  $t(540) = 3.86$ ,  $p < .01$ ).

**6.2.2. Commitment to choice.** We conducted a binary logistic regression on participants’ choice commitment, with regulatory focus and popularity sign as between-

subjects factors. The analysis revealed a significant interaction effect of popularity sign and regulatory focus ( $\text{Wald}(1) = 4.49; p = .03$ ). Consistent with H2, participants in the prevention condition were less likely to commit to their initial choice in the presence (70%) versus absence (82%) of the popularity sign ( $\chi^2(1) = 4.55, p = .03$ ). Such an effect did not arise in the promotion condition (76% vs. 72%;  $\chi^2(1) = .67, p > .2$ ). The main effects of popularity sign ( $\text{Wald}(1) = .67, p > .2$ ) and regulatory focus ( $\text{Wald}(1) = 1.05, p > .2$ ) were not significant.

*6.2.3. Consideration set heterogeneity.* To measure the heterogeneity of the consideration set for each participant, we used a formula inspired by the work of Ratneshwar, Pechmann, and Shocker (1996). Using this formula, we measured whether or not participants included alternatives with different attributes in their consideration set. For a given attribute (e.g., type of tea, brand, and package design), the formula enabled us to calculate the heterogeneity index  $H_{Index}$  for each participant's consideration set as follows:

$$H_{Index} = \frac{N_{Set}}{N_T} \times F,$$

where  $N_{Set}$  is the number of product categories represented in the consideration set,  $N_T$  is the total number of available product categories, and  $F$  is the fraction of all pairwise combinations of the alternatives in the consideration set that are across-category comparisons (see Appendix A in supplementary materials for an example of developing a heterogeneity index).

For each consideration set, we calculated the heterogeneity index (following the formula above) with respect to the brand, type of tea, package design (five independent judges who examined the entire set of products offered in the online store evaluated the product attributes and identified these three attributes as most important). At the end, we calculated the average of these three indexes to obtain one global heterogeneity index for each consideration set (it is worth noting that the  $H_{Index}$  could not be defined for a consideration set with only one product).

To examine the effect of popularity signs on consideration set heterogeneity, we

conducted an ANOVA with popularity sign and regulatory focus as between-subjects factors. The results revealed a significant interaction ( $F(1, 478) = 5.10, p = .02$ ). Additional analyses revealed that participants with a prevention focus formed a marginally more heterogeneous consideration set in the presence (vs. absence) of the popularity sign ( $H_{sign} = .50$  vs.  $H_{no\ sign} = .47; F(1, 478) = 3.34; p = .07$ ). Such an effect did not arise in the promotion condition ( $H_{sign} = .48$  vs.  $H_{no\ sign} = .50; F(1, 478) = 1.87; p = .17$ ). Moreover, the results indicated no main effects of regulatory focus ( $F(1, 478) = .11; p > .2$ ) or popularity sign ( $F(1, 478) = .17; p > .2$ ).

*6.2.4. Mediation analysis.* To investigate whether the increased heterogeneity of the consideration set may have led prevention-focused participants to greater choice uncertainty and less choice commitment, we conducted a moderated serial mediation analysis (Model 86 in Process 3). Consistent with H3, bootstrapping with 10,000 resamples revealed a significant moderated serial mediation (index = .0952, SE = .0541, 95% CI = [.0100, .2202]). The indirect effect of popularity sign on consumer choice commitment through consideration set heterogeneity and choice uncertainty was significant in the prevention condition ( $\beta = -.0564$ , SE = .0345, 95% CI = [−.1343, −.0007], but not in the promotion condition ( $\beta = .0388$ , SE = .0361, 95% CI = [−.0226, .1199]) (See Fig. 1).

### 6.3. Discussion

The results of this study show that consumers with a prevention focus form more heterogeneous consideration sets in the presence (vs. absence) of popularity signs. Moreover, choosing from a heterogeneous consideration set relates to consumers feeling more uncertain that they are making the optimal choice, leading to greater willingness to switch their choice. These findings provide a better understanding of how popularity signs influence consumer choice processes and post-choice experience.

## 7. Study 4

Study 4 investigates two boundary conditions to the effects established in our previous studies. Specifically, we examined the moderating roles of assortment size and signaled product framing. We expected the negative effects of popularity signs on prevention-focused consumers to be attenuated when they choose from a small (vs. large) assortment and when the signaled product's framing is congruent (vs. not) with their regulatory focus (H4 and H5).

### 7.1. Method

We implemented a 2 (regulatory focus: promotion vs. prevention)  $\times$  3 (popularity sign on a promotion-framed product vs. prevention-framed product vs. no sign)  $\times$  2 (assortment size: large vs. small) between-subjects design. Five-hundred seven students participated in exchange for standard payment and a product that they would receive at the end of the experiment in our university lab. The procedure of the experiment was similar to that in Study 3. Participants began by watching a commercial video that we designed about tea and writing an essay on this topic. Then, they visited an online tea store, which offered 28 different types of tea in the large assortment condition and six different types of tea in the small assortment condition. Participants were asked to select one product they would like to receive at the end of the study as part of their compensation. In the popularity sign/promotion-framed product condition, two of the promotion-framed products were labeled as "best seller". In the popularity sign/prevention-framed product condition, two of the prevention-framed products were labeled as "best seller." In the no-sign condition, none of the products had such a label. The promotion-framed product was described as helping consumers achieve a positive outcome (i.e., boosts energy level), and the prevention-framed product was described as helping consumers avoid negative outcomes (i.e., reduces stress) (these framings were validated in a pre-test by participants from the same population as the main study). After

selecting a product from the store, participants completed mood, product familiarity and demographics measures similar to those in Studies 2 and 3.

Participants finally visited the physical version of the same products they were offered in the online store. They were told that they could take the product they had selected in the online store or switch and choose any other product. The experimenter recorded their choice and later coded whether or not they had stuck with their initial choice.

## 7.2. Manipulation checks

We conducted a pre-test to assess the effectiveness of the regulatory focus manipulation. Eighty-eight students from the same population were exposed to the same manipulation as in the main study. We asked them on a four-item scale whether their thoughts were focused on specific promotion benefits (e.g., increasing energy level) or prevention benefits (e.g., preventing fatigue; based on Lee & Aaker, 2004). The results revealed that participants in the prevention condition were more focused on prevention benefits (promotion focused items were reverse coded) than participants in the promotion condition ( $M_{prevention} = 4.14$  vs.  $M_{promotion} = 3.80$ ;  $t(86) = 2.45$ ,  $p = .02$ ).

## 7.3. Results

Prior to the analyses and similar to the previous studies, we excluded participants who did not follow the procedure of the experiment (i.e., failed the essay task; had not taken any product from the store). We used the data from 493 participants for the analyses (41% female,  $M_{age} = 21.02$ ).

*7.3.1. Commitment to choice.* We conducted a binary logistic regression on participants' choice commitment, with regulatory focus, popularity sign, and assortment size as factors. The results revealed a marginally significant three-way interaction ( $Wald(2) =$

5.65,  $p = .06$ ). The findings also indicated a marginally significant main effect of assortment size (Wald(1) = 3.24,  $p = .07$ ), but no main effects of regulatory focus and popularity sign. Additional analyses revealed that when participants chose from the large assortment, the two-way interaction of regulatory focus and popularity sign on choice commitment was significant (Wald(2) = 6.17,  $p = .05$ ) but not when they chose from the small assortment (Wald(2) = 1.04,  $p > .2$ ). These results confirm that the effect of regulatory focus on participants' response to popularity signs is stronger when they chose from the large (vs. small) assortment.

We proceeded to examine the contrasts within the *large assortment* condition and found that, as posited in H4, participants in the prevention condition were less likely to commit to their initial choice in the presence (both prevention and promotion framed signaled products together; 54%) versus absence (73%) of the popularity sign ( $\chi^2(1) = 3.95$ ,  $p = .05$ ). However, participants in the promotion condition were slightly more likely to commit to their choice in the presence (63%) versus absence (57%) of the popularity sign, though the difference was not statistically significant ( $\chi^2(1) = .48$ ,  $p > .2$ ). We next examined whether the signaled products' framing influenced participants' commitment to their choice. Consistent with H5, the results revealed that prevention-focused participants were less likely to commit to their choice in the presence (47%) versus absence (73%) of the popularity sign when the framing of the signaled products was not congruent with their regulatory orientation ( $\chi^2(1) = 5.79$ ,  $p = .02$ ). We did not observe such an effect when the framing of the signaled products was congruent with participants' regulatory orientation (61% vs. 73%;  $\chi^2(1) = 1.29$ ,  $p > .2$ ). Thus, although the presence of popularity signs decreases the choice commitment among prevention-focused participants when choosing from a large assortment, this effect is markedly stronger if the product's framing does not match their regulatory focus. This was not the case for participants with a promotion focus ( $\chi^2(2) = 1.27$ ,  $p > .2$ ).



Finally, the results of contrasts within the *small assortment* condition revealed that the presence (vs. absence) of popularity signs did not influence the percentage of participants committed to their choice in either the prevention (83% vs. 68% vs. 76%,  $\text{Wald}(2) = 2.31, p > .2$ ) or the promotion (68% vs. 61% vs. 76%,  $\text{Wald}(2) = 1.98, p > .2$ ) condition (see supplementary materials).

#### 7.4. Discussion

Study 4 provides further evidence that the presence (vs. absence) of popularity signs results in less choice commitment for consumers with a prevention focus. Although it is often assumed that such signs are particularly helpful when the assortment is large (vs. small), our results indicate that the negative effect of popularity signs on consumers with a prevention focus is stronger when they select from a large (vs. small) assortment. The findings also suggest that if the framing of the signaled product is congruent with consumers' regulatory focus, the negative effect of popularity signs may be attenuated.

### 8. Study 5a

Study 5a has two main purposes. The first is to test the efficiency of an unobtrusive and managerially relevant method to identify consumer regulatory focus. To do so, we tracked consumers' information search behavior (prior to a purchase) and assessed whether they were searching for relatively more prevention- or promotion-focused information. We considered this an indicator of whether consumers were more interested in prevention or promotion concerns (Mowle, Georgia, Doss, & Updegraff, 2014). The second purpose is to control for consumers' initial choice. If consumers do not have an identical selection rate of the signaled products in the first place, differential choice commitment could be attributed to pure choice probability effects. To ensure that consumers did not differ in their initial choices, we

provided popularity signs on some products in an online store but rendered them unavailable for choice.

### *8.1. Method*

Three hundred ninety-nine participants were recruited on MTurk in exchange for standard payment. To identify participants' regulatory focus, we tracked the extent to which they searched for more prevention or promotion information prior to purchasing toothpaste. Participants were presented with different pieces of information (i.e., ten attributes) about toothpastes, half of which were related to toothpastes' prevention attributes (e.g., preventing cavities, fighting plaque buildup) and the other half were related to promotion attributes (e.g., freshening breath, whitening teeth).<sup>1</sup> By clicking on each piece of information, participants could read a full description of the information. The lengths of the descriptions were similar across prevention and promotion attributes. We considered the extent to which participants searched for more prevention versus promotion information as an indicator of whether they were motivated by prevention or promotion concerns (Mowle et al., 2014). To take into account both prevention and promotion information search behavior, we defined a relative regulatory focus index by subtracting the time participants spent on the prevention information from the time spent on the promotion information (higher positive values indicated that they were more prevention oriented; while higher negative values indicated that they were more promotion oriented). There was also a statistically significant relationship between the time spent on the prevention (vs. promotion) information and the number of prevention (vs. promotion) attributes they checked ( $r = .58, p < .001$ ). Participants could decide to stop the information search at any time and to proceed to the next step.

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<sup>1</sup> We conducted a pre-test with 52 participants to verify that prevention and promotion attributes were similarly important. The results revealed no significant difference ( $M_{promotion} = 5.94$  vs.  $M_{prevention} = 5.99$ ;  $t(51) = -.61, p > .2$ ).

In the next step, we asked participants about their goals when buying toothpaste to examine whether those who had searched for more prevention (vs. promotion) information were indeed more prevention (vs. promotion) focused. First, we measured regulatory focus by assessing whether their general thoughts would be focused on avoiding negative outcomes or achieving positive outcomes (Wan et al., 2009). Second, we asked them on a four-item scale the extent to which they would focus on specific promotion attributes (e.g., whitening the teeth) and prevention attributes (e.g., avoiding bad breath; based on Lee & Aaker, 2004).

Participants were then directed to an online store offering 24 different types of toothpaste. The study involved two (popularity sign: present vs. absent) between-subjects experimental conditions. In the popularity signs present condition, two products on the top of the web store were highlighted as being the “best seller,” but these products were not available in the main selection (i.e., out of stock). Participants were asked to select a product from the main selection and then to answer two seven-point questions about their choice decision (“To what extent do you wish that you had chosen any other option?”; “How confident are you that you made the best choice?”). We calculated the average of these two items to obtain an index of choice uncertainty. Moreover, we measured participants’ perception of choice commitment (“To what extent are you willing to switch your choice of toothpaste with another product?”; 1 = *not at all*, 7 = *to a great extent*). We also examined the activation of persuasion knowledge among participants by asking a four-item question adapted from Hibbert, Smith, Davies, and Ireland (2007) (e.g., “The store was trying to offer the products I don't really need”; 1 = *strongly disagree*, 7 = *strongly agree*; Cronbach’s  $\alpha$  = .88). Finally, participants responded to familiarity and demographic questions similar to previous studies.

## 8.2. Results

Prior to the analyses, we excluded participants who did not follow the procedure of the experiment and explicitly mentioned that we should not include their responses. We used the data from the remaining 390 participants (49% female,  $M_{age} = 38.03$ ).

*8.2.1. Regulatory focus checks.* The results of a linear regression revealed a significant effect of participants' information search behavior on their regulatory focus. Participants who searched for relatively more prevention (vs. promotion) information were more prevention focused, as they indicated that they wanted to avoid negative outcomes ( $\beta = .006$ ,  $t(388) = -2.69$ ,  $p = .008$ ) and were more focused on prevention attributes (promotion-focused items were reverse coded) ( $\beta = .002$ ,  $t(388) = 2.89$ ,  $p = .004$ ).

*8.2.2. Choice uncertainty.* We regressed choice uncertainty on the binary popularity sign variable (0 = sign not present, 1 = sign present on unavailable products), the continuous regulatory focus index, and the cross-product of these two variables. The results revealed a significant interaction effect of regulatory focus and popularity sign on choice uncertainty ( $\beta = .008$ ,  $t(386) = 2.70$ ,  $p = .007$ ). The more prevention-focused participants were, the more they were uncertain about their choice when popularity signs were present (vs. absent). The Johnson–Neyman values indicated that participants who had spent at least 57.57 seconds more on searching for prevention (vs. promotion) information were significantly more uncertain about their choice in the presence (vs. absence) of popularity signs. The results also indicated a main effect of regulatory focus ( $\beta = -.01$ ,  $t(386) = -2.54$ ,  $p = .01$ ) but no main effect of popularity sign ( $\beta = -.07$ ,  $t(386) = -.61$ ,  $p > .2$ ). Including the total amount of time participants spent (searching for both prevention and promotion information) as a covariate in the analyses did not influence the pattern of results.

*8.2.3. Choice commitment.* A regression analysis revealed a significant interaction effect of popularity sign and regulatory focus on participants' perception of their choice commitment ( $\beta = -.009$ ,  $t(386) = -1.96$ ,  $p = .05$ ). Participants with a higher prevention focus

indicated that they would be less likely to commit to their choice in the presence (vs. absence) of popularity signs. The Johnson–Neyman value indicated that participants who spent at least 12.93 seconds more on the prevention (vs. promotion) information were significantly more likely to switch their choice and therefore were less likely to commit to their choice in the presence (vs. absence) of popularity signs. The results indicated a marginally significant main effect of regulatory focus ( $\beta = .01, p = .09$ ) and a non-significant effect of popularity sign ( $\beta = -.24, p = .17$ ).

*8.2.4. Persuasion knowledge.* The results of a linear regression showed a significant interaction effect of popularity sign and regulatory focus on participants' persuasion knowledge activation ( $\beta = .007, t(386) = 2.03, p = .04$ ). Participants with a higher prevention motivation experienced greater negative persuasion knowledge when popularity signs were present (vs. absent). The Johnson–Neyman value indicated that participants who spent at least 3.83 seconds more on the prevention (vs. promotion) information showed a significant difference in the activation of negative persuasion knowledge in the presence (vs. absence) of popularity signs.

### 8.3. Discussion

The findings of this study show that the mere presence of popularity signs in the store influences consumers' post-choice experience even when the signaled products are not among their initial choices. The findings also show that the presence of popularity signs activates persuasion knowledge among consumers with a higher prevention focus. This study provides managerially relevant information. It demonstrates that if consumers search for relatively more prevention (vs. promotion) information prior to their decisions, they are more motivated by prevention (vs. promotion) concerns, and this preference consequently influences their responses to the presence of popularity signs. Online retailers can easily track the type of

information consumers search for (either on a third-party website or on their own platform) and subsequently provide a targeted marketing strategy (e.g., Moe, 2003).

## 9. Study 5b

Similar to Study 5a, the purpose of Study 5b is twofold. The first goal is to use an actionable manipulation of regulatory focus. To do so, we followed the taglines used by a major brand's website (<https://www.colgate.com/en-us>) and manipulated regulatory focus by changing the framing of the taglines in our online store. The second purpose of this study is to control for consumers' initial choice. We enriched our store design by implementing three conditions: one without the popularity sign, one with the popularity sign on products that participants could select, and a third condition with the popularity sign on products that participants could not select. We predicted featuring a popularity sign on products that could or could not be selected to have the same effects on consumers' post-choice experience.

### 9.1. Method

Study 5b was a 2 (regulatory focus: promotion vs. prevention)  $\times$  3 (popularity sign: present on available products vs. present on unavailable products vs. absent) between-subjects design. We recruited 602 participants from MTurk who were asked to visit a retail website offering 24 different types of toothpastes. In the prevention condition, a tagline, which appeared on the top of the web store, read: "Advanced toothpastes to prevent every cavity." In the promotion condition, the tagline read: "Advanced toothpastes to brighten every smile." In the popularity sign present on unavailable (available) products condition, two products were highlighted as being the "top-rated" products, but these products were unavailable (available) in the main selection (i.e., out of stock). Participants were asked to choose a product from the main selection provided. It was emphasized that they would enter a draw to win a 10-piece

box of their chosen toothpaste. After selecting a product from the online store, participants responded to two manipulation checks of regulatory focus similar to Study 3. Next, participants were reminded that they would be entered into a draw with the chance to win a box of their chosen toothpaste. To measure choice commitment, participants were given the opportunity to change their choice of toothpaste for this draw. Finally, they responded to mood, familiarity, and demographic questions similar to previous studies.

## 9.2. Results

Similar to previous studies, we excluded participants who did not follow the procedure of the experiment and explicitly mentioned that we should not include their responses. We used the data from the remaining 591 participants (49% female,  $M_{age} = 38.37$ ).

*9.2.1. Manipulation checks.* The results of independent-samples *t*-tests showed that participants in the prevention (vs. promotion) condition were more focused on avoiding negative outcomes ( $M_{promotion} = 5.99$  vs.  $M_{prevention} = 5.32$ ;  $t(589) = -4.60$ ,  $p < .001$ ). Moreover, participants in the prevention (vs. promotion) condition were more focused on prevention benefits ( $M_{promotion} = 5.59$  vs.  $M_{prevention} = 6.11$ ;  $t(589) = 5.33$ ,  $p < .001$ ), while participants in the promotion (vs. prevention) condition were more focused on promotion benefits ( $M_{promotion} = 5.48$  vs.  $M_{prevention} = 4.56$ ;  $t(589) = -7.28$ ,  $p < .001$ ).

*9.2.2. Commitment to choice.* We conducted a binary logistic regression on participants' choice commitment, with regulatory focus and popularity sign as between-subjects factors. The results revealed a significant interaction ( $Wald(2) = 5.92$ ;  $p = .05$ ). Participants in the prevention condition were less likely to commit to their choice in the presence (vs. absence) of popularity signs, both when signaled products were available (70% vs. 89%;  $\chi^2(1) = 11.35$ ,  $p < .001$ ) and unavailable (65% vs. 89%;  $\chi^2(1) = 16.80$ ,  $p < .001$ ) in the main selection. Moreover, there was no difference in the choice commitment between

participants who had the possibility to choose the signaled products and those who did not (70% vs. 65%;  $\chi^2(1) = .59, p > .2$ ). In the promotion condition, the rate of choice commitment did not vary among the three conditions (60% vs. 63% vs. 70%;  $\chi^2(2) = 2.16, p > .2$ ).

### *9.3. Discussion*

The results of Study 5b provide further evidence that the mere presence of popularity signs, regardless of the choice of the signaled products, decreases choice commitment for prevention- (vs. promotion-) focused consumers. The findings also show that marketers can easily induce regulatory focus by using common commercial taglines. These findings demonstrate that the situational framing of the company's offerings in a choice set influences consumer choice processes. In the marketplace, an entire product category may also be related to a prevention (e.g., helmet) or a promotion (e.g., cosmetics) focus. In Study 6, we examine whether popularity signs affect consumers' post-choice experience in such product categories.

## **10. Study 6**

The purpose of our concluding study is to extend the practical significance of our research. As greater choice uncertainty is negatively related to satisfaction (e.g., Heitmann, Lehmann, & Herrmann, 2007) and consumers with lower post-choice satisfaction are more likely to share negative word of mouth and write negative reviews (e.g., Wetzter, Zeelenberg, & Pieters, 2007), we examined the impact of popularity signs on online product ratings and reviews. We expected that prevention- (vs. promotion-) focused products with a popularity sign would receive lower ratings and relatively less positive reviews.

### *10.1. Method*



Amazon.com is one of the largest B2C online retailers and hosts various user-generated product reviews (e.g., Chevalier & Mayzlin, 2006). Reviewers use stars (from one to five) to indicate their overall evaluation of the product and they can write review texts to explain or justify the assigned stars. Over a period of five weeks, we collected daily reviews for products with and without a popularity sign (e.g., “best seller”) across six product categories. We selected three product categories (sunscreen, helmets, safety glasses) as prevention-focused products, and three product categories (perfume, nail polish, and jewelry) as promotion-focused products based on a pre-test (see supplementary materials). Our investigation focused on well-established products (those that had more than 100 reviews before data collection). For each review in our sample, we gathered information on the following variables: (1) the date on which a review was posted; (2) customer rating (number of stars); (3) product price; (4) product type (a dummy variable with 1 indicating promotion-focused and 0 prevention-focused products); and (5) provision of popularity sign (a dummy variable with 1 indicating the presence and 0 the absence of a sign). We stopped data collection when we reached the pre-determined sample of 1000 product reviews.

## 10.2. Results

*10.2.1. Rating of the products.* We conducted a two-way ANOVA on product ratings, and the results revealed a significant regulatory focus  $\times$  popularity sign interaction ( $F(1, 996) = 171.57, p < .001$ ). The results of the planned contrast showed that prevention-focused products received lower ratings in the presence (vs. absence) of a popularity sign ( $M_{sign} = 3.84$  vs.  $M_{no\ sign} = 4.69; F(1, 996) = 56.54, p < .001$ ), while promotion-focused products received higher ratings in the presence (vs. absence) of a popularity sign ( $M_{sign} = 4.47$  vs.  $M_{no\ sign} = 3.15; F(1, 996) = 111.98, p < .001$ ). The results also revealed significant main

effects of regulatory focus ( $M_{prevention} = 4.30$  vs.  $M_{promotion} = 3.97$ ;  $F(1, 996) = 31.02$ ,  $p < .001$ ) and popularity sign ( $M_{sign} = 4.22$  vs.  $M_{no\ sign} = 4.02$ ;  $F(1, 996) = 8.00$ ,  $p < .01$ ).

*10.2.2. Content analysis of the reviews.* Positive and negative affective content contained in reviews influences consumer attitudes and retail performance (e.g., Chevalier & Mayzlin, 2006; Langan, Besharat & Varki, 2017). We used text mining to examine changes in the negative and positive affective content of product reviews depending on the type of product (promotion vs. prevention-focused) and the presence (vs. absence) of popularity signs. To do so, we used the linguistic inquiry and word count (LIWC) program to analyze online review texts (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007). The validity of LIWC dictionaries is confirmed by extant studies that apply this methodology to various types of texts such as blogs and online reviews (e.g. Slatcher & Pennebaker, 2006). We used two LIWC categories related to negative affective (consisting of words such as “hate” and “wrong”) and positive affective (e.g., “nice” and “love”) content, and for these two categories, we retrieved the word count. To take into account both positive and negative affective content, we defined an affective content index per review (AC index) by subtracting the number of negative words from the number of positive words.

The results of a two-way ANOVA revealed a significant interaction effect of regulatory focus and popularity sign on the AC index ( $F(1, 996) = 12.17$ ,  $p = .001$ ). Additional analyses revealed that the presence of popularity signs decreases the AC index for prevention-focused products ( $M_{sign} = 1.29$  vs.  $M_{no\ sign} = 1.67$ ;  $F(1, 996) = 6.02$ ,  $p = .01$ ), indicating that the number of positive relative to the negative words is lower in the presence of a popularity sign. However, the presence of popularity signs increases the AC index for promotion-focused products ( $M_{sign} = 1.63$  vs.  $M_{no\ sign} = 1.24$ ;  $F(1, 996) = 6.14$ ,  $p = .01$ ). The results revealed no main effects of regulatory focus ( $M_{prevention} = 1.49$  vs.  $M_{promotion} = 1.48$ ;  $F < 1$ ) or

popularity sign ( $M_{sign} = 1.49$  vs.  $M_{no\ sign} = 1.48$ ;  $F < 1$ ). Including the total number of words written in each review as a covariate in the analyses did not affect the pattern of results.

### *10.3. Discussion*

The results of this study further illustrate the marketing relevance of our theorizing. The findings show that providing popularity signs such as “best seller” for a prevention- (vs. promotion-) focused product leads to negative downstream consequences in online customer behavior, substantiated by lower product ratings and less positive product reviews. These findings also suggest that retailers can customize the provision of popularity signs depending on the nature of the marketed product category.

## **11. General discussion**

Marketers are fortunate in that they can decide how to best adapt their retail environments to enhance consumer experience. We explore a common technique that marketers use to assist consumers during their choice decisions: product popularity signs. The provision of such signs can be controlled by marketers and can affect consumer choice processes and shopping experiences. Past research shows that popularity signs can be effective at promoting signaled products and simplifying consumer decision process (e.g., Axsom et al. 1987; Cai et al., 2009). In spite of this, we contend and show that these signs can also have aversive effects on consumer choice processes and post-choice behavior. Across seven studies carried out in the lab with incentivized choices and in the field, we demonstrate that commonly used popularity signs such as “best seller”, instead of simplifying decisions and helping consumers, can increase feelings of uncertainty, decrease choice commitment, and affect subsequent product evaluations and reviews. We show that the strength of these

negative effects depends on the moderating role of regulatory focus, which represents key motivational orientations that consumers adopt during their choice processes.

Study 1 shows that the presence of popularity signs increases choice uncertainty and decision complexity for consumers who have a chronic prevention (vs. promotion) orientation. Studies 2 and 3 demonstrate that the presence of popularity signs decreases the choice commitment of consumers with a prevention focus. Study 3 further demonstrates that the presence of such signs may increase the heterogeneity of the consideration set for consumers with a prevention focus, which in turn may affect their choice uncertainty and choice commitment. Study 4 shows that the negative effect on choice commitment may be attenuated if the signaled product's framing is congruent with the regulatory focus of prevention-focused consumers or if the assortment size is small (vs. large). Studies 5a and 5b show that the mere presence of popularity signs, even when the signaled product cannot be selected, leads to negative consequences among prevention-focused consumers. Finally, Study 6 further highlights the marketing consequences of our theorizing and demonstrates that prevention-focused products (e.g., helmets) with popularity signs receive lower ratings and relatively less positive reviews than the same products without popularity signs. A summary of results can be found in Tables 1 and 2.

Despite the differential effect of popularity signs on consumer *choice processes and post-choice behavior*, our findings show that the presence of popularity signs does not impact the *choice of the signaled product* differently between prevention- and promotion-focused consumers. We conducted additional analyses across the relevant studies to compare the selection rate of signaled products between prevention and promotion-focused consumers. The findings revealed that there was no significant difference in the selection rate of signaled products between prevention- and promotion- focused participants (*Study 2*: 28% vs. 15%,  $\chi^2(1) = 2.03, p = .15$ ; *Study 3*: 25% vs. 19%,  $\chi^2(1) = 1.15, p = .28$ ; *Study 4*: 13% vs. 12%,  $\chi^2$

(1) = .08,  $p = .77$ ). Past research provides reasons for these findings by showing that there are conflicting forces at play. For example, prevention (vs. promotion) focus may be associated with interdependent (vs. independent) self-construals (Lee et al., 2000), consequently enhancing motivation to conform to others' opinions (Pham & Higgins, 2005; Torelli, 2006). Therefore, it might be argued that prevention- (vs. promotion-) focused consumers could be more likely to choose products with popularity signs. On the other hand, prevention-focused individuals are more risk averse, cautious and focused on their pre-committed goals, whereas promotion-focused individuals are less sensitive to the risk associated with new opportunities (e.g., Herzstein, Posavac, & Brakus, 2007), and are more willing to go beyond the given status quo (e.g., Chernev, 2004). Therefore, it can be argued that promotion- (vs. prevention-) focused individuals are more likely to perceive products with popularity signs as an opportunity that carries a risk worth taking. These two sets of arguments provide support for our findings that there is no clear differential effect of popularity signs on the selection of the signaled product between prevention- and promotion-focused consumers.

Overall, our research makes several important contributions to the literature. First, whereas the emphasis of prior research has been on the effect of popularity signs on consumer choice of the signaled product (e.g., Cai et al., 2009), we focus our attention on the negative effect of popularity signs on consumer choice process and post-choice behavior (i.e., choice commitment). Second, we demonstrate that a key motivational factor—consumer regulatory orientation—moderates the effect of popularity signs on consumer decision processes. So far, little attention has been paid to the effect of motivational factors on consumer response to popularity signs. We address this gap and show that consumers react differently to the presence of popularity signs depending on their regulatory orientation. Third, we show that the negative effect of popularity signs can be due to changes in consumer consideration set formation. We show that depending on consumer regulatory orientation, providing popularity

signs leads consumers to include different types of products in their consideration set. Our research also has several methodological strengths. We operationalized regulatory focus both chronically and situationally; mostly focused on real consumer decisions rather than hypothetical scenarios; and relied on lab, online, and field studies.

### *11.1. Managerial implications*

Invesp Infographic (Khalid, 2016) reports that 30% of products sold online are returned, suggesting that consumers often do not remain committed to their chosen product. As product switching and product returns have high processing costs and low salvage value (Janakiraman et al., 2016), increasing consumer choice commitment is of considerable importance to retailers. Moreover, consumers who experience greater choice uncertainty have lower post-choice satisfaction and are more likely to write negative reviews (e.g., Langan et al., 2017; Wetzer et al., 2007). Retailers are therefore motivated to enhance consumer post-choice experience. Our findings suggest that they can do so by using consumer regulatory focus as a basis for customization of popularity sign provision. First, online retailers with access to data about their customers can apply our findings by adjusting the provision of popularity signs for certain customers. Online retailers can measure the chronic regulatory orientation of their customers by asking several questions when consumers create their profile, similar to Study 1. Second, online retailers can track consumers' information search behavior before making a purchase to identify their regulatory focus and tailor the popularity sign strategies accordingly, as in Study 5a. Third, retailers can use focused taglines in online stores to induce a more promotion- or prevention-oriented mindset while consumers are shopping, similar to Study 5b. Finally, many product categories are often positioned to help consumers avoid negative outcomes (e.g., helmets) and thus are more related to a prevention focus. Given the results of Study 6, retailers might consider not providing popularity signs in

such product categories.

Our findings also suggest that marketers should adopt an appropriate regulatory focus framing if they want to include popularity signs in their advertising messages. Regulatory focus framing can affect the effectiveness of advertising messages (e.g., Jain, Agrawal, & Maheswaran, 2006). If marketers want to use an advertising message that features popularity signs, they might consider framing it with a promotion focus rather than a prevention focus.

In some situations, marketers might also want to reduce choice commitment and instead try to encourage switching behavior within their customers' choice sets—for example, for products with low margins, for which both retailers and manufacturers may be interested in encouraging consumers to switch to more profitable options in their offerings. In these situations, decision makers might consider implementing popularity signs, reinforced by a prevention-framed communicational strategy.

### *11.2. Future research directions*

In this research, we examined the effect of several distinct types of popularity signs (e.g., “best seller”, “most popular”) to generalize our findings. All of these signs indicated generic information provided to all consumers. One area for future research pertains to the personalization of popularity signs. For example, depending on consumer's choice history, retailers might provide information about the popularity of similar or relevant items. We speculate that providing customized popularity information might have more pronounced negative (positive) effects on choice commitment for consumers with different regulatory orientations. Another area of future research includes examining the impact of price-related signs together with popularity information on consumer choice processes (e.g., when a “best seller” product carries a “sale price” sign). We think that the presence of a price-related sign in combination with a popularity sign might influence the activation of persuasion knowledge

differently; it may reduce risk perceptions and strengthen the credibility of popularity information in the eyes of prevention-oriented consumers. Finally, we focused on fast-moving products and our investigations were limited to consumer switching behavior following one-shot events. We did not examine how consumer uncertainty and commitment unfold over several purchase decisions over time. Future research could explore how popularity signs influence choice behaviors within a product category over a shorter (vs. longer) time frame; across product categories that are bought more (vs. less) frequently; and for products that require a bigger (vs. smaller) financial investment.



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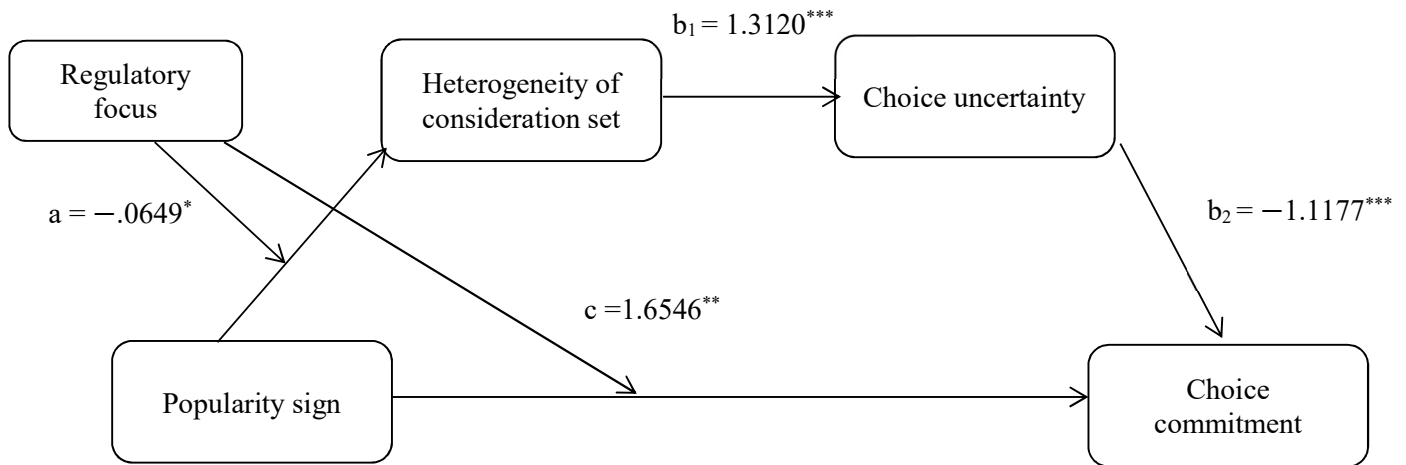
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**Fig. 1.** Study 3: Moderated serial mediation (\*\*\*:  $p < .001$ , \*\*:  $p < .01$ , \*:  $p < .05$ )

Notes—Regulatory focus: prevention=0, promotion=1; Popularity sign: absent=0, present=1

- $a$  is the coefficient of the interaction effect of popularity sign and regulatory focus on heterogeneity of consideration set;  $b_1$  is the coefficient of the effect of heterogeneity on choice uncertainty;  $b_2$  is the coefficient of the effect of choice uncertainty on choice commitment;  $c$  is the coefficient of the interaction effect of regulatory focus and popularity sign on choice commitment after accounting for mediators.
- Index of moderated serial mediation:  $\beta = .0952$ ,  $SE = .0541$ , 95% CI = [.0100, .2202].
- Indirect effect (serial mediation) in the prevention condition:  $\beta = -.0564$ ,  $SE = .0345$ , 95% CI = [-.1343, -.0007].
- Indirect effect (serial mediation) in the promotion condition:  $\beta = .0388$ ,  $SE = .0361$ , 95% CI = [-.0226, .1199].

Percentage of the participants committed to their choice							Hypothesis
	Prevention focused participants			Promotion focused participants			
	Popularity sign	No sign		Popularity sign	No sign		
Study 2	38%	68%		54%	43%		H2
Study 3	70%	82%		76%	72%		H2, H3
	Sign on prevention products	Sign on promotion products	No sign	Sign on prevention products	Sign on promotion products	No sign	
Study 4/ large assort.	61%	47%	73%	58%	67%	57%	H4, H5
Study 4/ small assort.	68%	83%	76%	61%	68%	76%	
	Sign on available products	Sign on unavailable products	No sign	Sign on available products	Sign on unavailable products	No sign	
Study 5b	70%	65%	89%	60%	63%	70%	H2
Study 6	Prevention-focused products			Promotion-focused products			
	Popularity sign	No sign		Popularity sign	No sign		
Product rating	3.84	4.69		4.47	3.15		
AC index	1.29	1.67		1.63	1.24		

**Table 1.** Summary results of the effect of popularity sign on consumer choice behavior

Choice uncertainty			Choice commitment	Hypothesis
<b>Study 1</b>	<i>Regulatory focus</i>	.14**		<i>H1</i>
	<i>Popularity sign</i>	-.34		
	<i>Regulatory focus</i> × <i>popularity sign</i>	.17*		
<b>Study 5a</b>	<i>Regulatory focus</i>	-.01**	.01	<i>H1, H2</i>
	<i>Popularity sign</i>	-.07	-.24	
	<i>Regulatory focus</i> × <i>popularity sign</i>	.008**	-.009*	

**Table 2.** Summary results of the effect of popularity sign on consumer choice behavior; regression coefficients

(\*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ )



### Appendix A. Example of developing the heterogeneity index in Study 3

Assume that a tea store has three types of tea: anti-cough (type A), spiced tea (type B), and herbal tea (type C). This means that  $N_T$  is equal to 3. Moreover, each type of tea contains different products—for example: {A1, A2, A3, A4}, {B1, B2, B3}, and {C1, C2, C3, C4, C5}, where A1 denotes the first product with type A.

Imagine that a consumer's consideration set is equal to {A1, A2, A3, B1, B2}. In this consideration set,  $N_{Set}$  is equal to 2, and all the possible pairwise combinations are as follows: (A1, A2), (A1, A3), (A1, B1), (A1, B2), (A2, A3), (A2, B1), (A2, B2), (A3, B1), (A3, B2), and (B1, B2),

which is equal to 10 different combinations. Among these combinations, six pairwise combinations do not include products within the same type. These combinations are:

(A1, B1), (A1, B2), (A2, B1), (A2, B2), (A3, B1), (A3, B2).

As a result, the coefficient  $F$  is, by definition, the fraction of across-category pairwise combinations to the total number of pairwise combinations, or 6/10. The heterogeneity index ( $H_{Index}$ ) with respect to the type of tea for this consideration set is therefore equal to

$$H_{Index} = \frac{N_{Set}}{N_T} \times F = \frac{2}{3} \times .6 = .4$$

In this example, we calculate the  $H_{Index}$  on the basis of the type of tea products. For the same consideration set, the  $H_{Index}$  can be likewise calculated with respect to other attributes.